UNIVERSITY OF HAWAII LIBRARY

ON THE HISTORY OF PONAPEAN PHONOLOGY*

PACIFIC AREA LANGUAGES MATERIALS
(PALM) Development Center
2424 Maile Way, Porteus 713
Honolulu, Hawaii 96822

Kenneth Rehg
University of Hawaii

This paper presents some preliminary observations on the history of Ponapean phonology. To provide a context for this discussion, synchronic statements about Ponapean dialectology and phonology are presented. Diachronic hypotheses are then developed by examining the phenomenon of segmental erosion from the right and by detailing Proto-Oceanic sources for the phonemes of the Main dialect. Finally, concluding comments are offered along with a list of PO/Ponapean cognates.

1.0 ABOUT PONAPEAN

Ponapean is a nuclear Micronesian language which serves as the lingua-franca of the Ponape district of the United States Trust Territory of the Pacific Islands. At present, Ponapean is spoken as a first language by approximately 16,000 inhabitants of the islands of Ponape, Ant, Ngatik, and Pingalap.[1] Although no variation studies have been conducted on this language, at least four geographically defined dialects may be easily discerned.

1.1 The Main Dialect

On the island of Ponape, in the municipalities of Madolenihmw, Uh, Net, and Sokehs, and in the administrative center of Kolonia, the northern or Main dialect is spoken. If one may speak of a prestige dialect of Ponapean, it is this one. It is the dialect most widely spoken and its pronunciation has been adopted as the basis for orthographic reform.[2] It is the dialect to be considered in this paper.

1.2 The Kiti Dialect

On the southern part of the island of Ponape, principally in the municipality of Kiti, the Kiti dialect is spoken. A few Kiti speakers also reside on the atoll of Ant. The Kiti dialect differs from the Main most noticeably in terms of vowel distribution. Many Main dialect forms containing [ɛ] have Kiti cogantes with [ɔ] or [a]. Further, a surface contrast between [e] and [ɛ] exists in the Main dialect that is not found in Kiti speech. In an essentially taxonomic analysis of the language, Garvin reports that "in the Kiti dialect, the only mid front vowel phoneme has a closed allophone [e] before y and w, and open allophone [ɛ] in all other positions; long e· is always as [ɛ·]...."[3] In section 2.3, it will be suggested that within a generative framework, a very similar statement may be made to account for occurrences of [e] in the Main dialect, and that the surface contrast between [e] and [ɛ] is not phonemic.

1.3 Ngatikese

Ngatikese is spoken on the atoll of Ngatik, located approximately 80 miles to the south of Ponape. Little information is available concerning this dialect, but other speakers of Ponapean characterize it as being an English/Ponapean creole. All dialects of Ponapean contain a large number of English loans, but apparently Ngatikese has borrowed entire phrases from English and employs loans not present in other Ponapean dialects. Purportedly this came about as a consequence of contact with New England whalers who, during the mid-nineteenth century, invaded the island, slaughtered the male population, and intermarried with the women. At least one unique phonological feature of Ngatikese has also been observed; that is, the trilled r of other dialects is reflected here as a voiceless velar fricative.

1.4 Pingalapese

The most divergent dialect of Ponapean is spoken on the atoll of Pingalap, located approximately 160 miles to the east of Ponape. Pingalapese borders on mutual intelligibility with other dialects. On the 100 word Swadesh list, for example, it shares 78 cognates with the Main dialect. Phonologically this dialect differs from others in at least two respects. First, monosyllabic nouns are tolerated, whereas in other dialects these forms undergo compensatory lengthening in reaction to the deletion of final vowels. Secondly, two consonantal phonemes of the other dialects, /t/ and /s/, are reflected as a single phoneme /s/ in Pingalápese.

2.0 PONAPEAN PHONOLOGY TODAY

Comparisons between Ponapean and Proto-Oceanic are based on the following inventory of systematic phonemes for the Main dialect of Ponapean.[4]

2.1 Consonants

	Bilabial	Apico-Dental	Apico-Alveolar	Retroflex	Dorso-Velar
Stops					
Plain	p^w) ?	t			k
Velarized	p)				
Affricates				ts	
Fricatives		s			
Nasals					
Plain	m	n			ŋ
Velarized	m^w) ?				
Laterals		l			
Trills			r̃		

For orthographic convenience, these phonemes will subsequently be written as follows:

The Phoneme	Will be Written
p^w	pw
m^w	mw
$\tilde{r}$	r
ts	t
ŋ'	ńg

All other phonemes will be represented as they are on the preceding chart.

2.2 Semi-Consonants

For the purpose of this report, two semi-consonants, /y/ and /w/ are postulated. The phonemic status of /y/, however, is uncertain.

2.3 Vowels

	Front Unrounded	Back Rounded
High	i	u
Mid	e	o
Low	ɐ	ɔ

+ length

Each of these vowels occurs long as well as short, with length being phonemic. Long vowels in this report will be written doubled.

Garvin, however, in his analysis states: "The main dialect of Ponapean has 7 determinate syllabic vowels: a, ɔ, ɛ, o, e, u, i; one indeterminate syllabic vowel: ə;...all the determinate syllabic vowels have the additional prosodic feature of quantity;...'[5] Thus, the analysis suggested in this paper differs from Garvin's in two respects. First, no intermediate vowel schwa is postulated. Second, the contrast between e and ɛ is not considered phonemic. Since this position has not before been formally presented, its bases are outlined below.

Note that in Garvin's analysis only determinate vowels may occur long. /ə/, an indeterminate vowel, is always short. It will be argued in this paper, however, that all vowel phonemes occur both long and short, and, when they are short, they all have central allophones conditioned by adjacent consonants.

Consonants in Ponapean form two series--a front series and a back series.

Front	Back
p	pw
m	mw
t	t
l	ŕ
n	ng
s	-
-	k

accounts for [2]

This front/back distinction is based on the observation that consonants of the front series centralize short back vowels, and conversely, consonants of the back series centralize short front vowels. Illustrations of this follow.

Front Vowels	Between Front C's		Between Back C's	
i	[pɨl]	'also'	[rɨŕ]	'secret'
e	[mɛm]	'sweet'	[teŋ]	'tight'
a	[pâp]	'swim'	[ḱɑ̈k]	'can'

Back Vowels	Between Front C's		Between Back C's	
u	[lus]	'jump'	[pʷuŋ]	'correct'
o	[pos]	'explode'	[topʷ]	'lush'
ɔ	[pɔs]	'hammer'	[ŕɔŋ]	'burned'

The examples above illustrate short vowel phonemes in 'pure' environments; that is, in positions between either front or back consonants. However, when these vowels occur between consonants of different series, as they often do, the vowel quality detectably glides in response to the adjacent consonant, with the following consonant dominating. An example of this is [mɛ̈ɔk] 'rust' where the onset of the vowel is front, but the primary quality of the vowel is central.

Further justification for setting up two series of consonants is the interesting fact that front/back consonants form pairs, as they are listed in the preceding chart, and these pairs, excluding s and k, almost never occur within the same morpheme.[6] Thus, a morpheme like pVp or pwVpw is acceptable, but not pVpw or pwVp. Apparently, there is a morpheme structure rule in Ponapean which involves consonant harmony of this nature.

Central vowels, then, even within a taxonomic framework, are not phonemic in Ponapean. Instead, consonants condition centralization in a manner reminiscent of Marshallese. The other point of disparity with Garvin's analysis, though, the number of mid-front vowels, is a consequence of the generativist position taken in this paper as opposed to the structuralist position taken by Garvin.

Garvin postulated two mid front vowels for the Main dialect, /e/ and /ɛ/, based on minimal pairs like [seysey] 'to cut hair' and [sɛysɛy] 'to paddle'; [eet] 'bag' and [ɛɛt] 'one'. However, other considerations are relevant here.

1) Excluding loan words, [e] never occurs long except as a consequence of compensatory lengthening. Thus, one finds forms like [eet], but in the construct it is [etin]. [ɛɛt] is also long in the construct, [ɛɛtin].
2) [e] is always followed by a high vowel or glide, either on the surface as in [seysey] or when affixed as in [etin]. [e] never occurs word finally.
3) Where minimal pairs occur between short [e] and [ɛ], the form containing [ɛ] has a related form with the vowel [a]. [sɛysɛy] means 'to paddle', but [saay] is 'a paddling trip'.
4) Other occurrences of short [ɛ] not alternating with [a] are not followed by high vowels or glides. Thus, [tɛ] 'or' or [mɛt] 'here'.

These observations then suggest that one postulate a single mid front vowel with a phonetic norm [ɛ] and a raised short allophone [e]. The following informal rules and base forms suggest how surface minimal pairs can be accounted for. The seemingly unnecessary complexity of the rules is motivated by other facts of the language not discussed here.

Base	sɛi	sai
Glide Insertion	sɛyi	sayi
Short ɛ → e/___C$_0$ [-cons, +high]	seyi	--
Short a → ɛ/___C$_0$ [+syllabic, +high, -back] # --		sɛyi
Final Vowel Deletion	sey	sɛy
Surface Form (Reduplicated)	seysey	sɛysɛy

To account for nouns like [eet], [ɛɛt], and [saay], it is necessary to add a lengthening rule which applies only to nouns of the canonical form #(C)VC(V)#.

Base	ɛti	ɛɛti	sai
Glide Insertion	--	--	sayi
Short ɛ → e/___C$_0$ [-cons, +high]	eti	--	--
Lengthening	eeti	--	saayi
Short a → ɛ /___C$_0$ [+syllabic, +high, -back] #--	--	--	--
Final Vowel Deletion	eet	ɛɛt	saay

Further discussion of the lengthening rule and its peculiar order with respect to final vowel deletion will be offered in section 3.2.

It is necessary, then, within a generative framework, to establish only a single mid front vowel phoneme. However, since the theoretical position on which this analysis is based is not accepted by all scholars, and so that information may not be lost to them, the sub-phonemic contrast of [e] and [ɛ] will continue to be indicated in all transcription.

3.0 EROSION FROM THE RIGHT

The deletion of final PO consonants and vowels is a phenomenon characteristic of Micronesian languages. The status of these final segment deletion rules, though, whether synchronic or diachronic, is not easily determined.

3.1 Final Consonant Deletion

In general, final PO consonants are lost in Ponapean.

*alap	alɛ	'take'
*qatop	ɔɔs	'thatch'
*awang	aaw	'mouth'
*ngkinit	kinii	'pinch'
*manang	nanaman	'spiritual power'
*onom	wene-	'six'
*pakiwak	pako	'shark'
*Ruap	uu	'tide'
*quling	iliil	'steer'

In five instances, however, final PO consonants are retained.

*inu(m)	nim	'drink'
*pang(ou)(n)	pangin	'awaken'
*piti(k)	pitik	'spring up'
*sakan	sakan	'eat - honorific'
*tokon	sokon	'cane'

The retention of the final *n in sokon is unexplainable. A possible explanation for the first four items, though, is suggested by the fact that they are all transitive verbs, three of which have derived intransitive forms which do not reflect the final consonant.

Transitive	Intransitive
pangin	mpɛng
pitik	pit
sakan	sak

The retention of the final PO consonant in these transitive verbs might be explained then by postulating the presence of a transitivizing suffix which blocked the application of the final consonant deletion rule. In the intransitive forms, where this suffix was not present, the final consonant dropped. This position seems highly tenable in light of synchronic facts about the language, where, in fact, transitive suffixes do occur.

A problem with this solution is that final consonants were deleted in some transitive forms.

*alap	alɛ	tr.	'take'
*ngkinit	kinii	tr.	
	kinikin	intr.	'pinch'
*quling	iliilii	tr.	
	iliil	intr.	'steer'

Since alɛ occurs only transitive, one might assume that no transitive suffix occurred with this form. In the case of the second two verbs, the intransitive form appears to be the base. Note the presence of the transitivizing suffix -ii. Which form of the verb was selected as the base, though, ultimately appears to be morphologically conditioned.

Further complexities with transitive/intransitive pairs are suggested by these verbs:

*saqit	tɛɛk	tr.	'sew'
	teytey	intr.	
*iriR	irip	tr.	'fan'
	irir	intr.	
*sampo	tapɛr	tr.	'catch'
	tapatap	intr.	
*puki	wikit	tr.	'turn'
	wik	intr.	

The transitive form of the verb in each of the above cases exhibits a final consonant. In no case, though, is this final consonant a reflex of the final reconstructed segment of the PO form. What the source is of these final consonants is at this point unexplaninable, but, of course, this is a common problem with Oceanic languages.

3.2 Final Vowel Deletion

A comparison of PO reconstructions and Ponapean cognates illustrates the motivation for a final vowel deletion rule.

*api	aay	'fire'
*dongo	rong	'hear'
*kuku	kiik	'nail'
*limu	liimw	'sponge, moss'
*masawa	nataw	'sea'

*nana	naan	'pus'
*puko	uuk	'net'
*sala	aal	'road'
*solo	tool	'mountain'
*tali	saal	'rope'
*tuki	suk	'pound'
*pituqu	usu	'star'

The effect of this rule is to delete a single final vowel mora. Thus, consider *pituqu. Since *q apparently goes to ∅ in all Micronesian languages, one may assume the loss of this consonant first. This results in an intermediate form pituu. By then deleting a final vowel mora, one can account for the short final vowel which is present in the Ponapean form, usu.

Further, it is clear that final vowel deletion must follow final consonant deletion in order to account for forms like these:

	*qatop 'thatch'	*awang 'mouth'
Final C Deletion	qato	awa
Other Rules	ɔɔso	aawa
Final V Deletion	ɔɔs	aaw

What is not clear is the extent to which this rule is a diachronic phenomenon of the language. As previously discussed in section 2.3, there is justification for establishing a synchronic final vowel deletion rule. Notice:

Elicitation Form	Construct Form
kiik	kikin
laang	lɛngin
aat	ɛtɛn

To derive these forms, the following bases and rules are postulated.

Bases

kiki 'nail', langi 'sky', ata 'name', ni 'construct suffix'.[7]

Compensatory Lengthening (CL)

$$\#[([+\text{cons}])[+\text{syll}][-\text{syll}]([+\text{syll}])]_{N\#} \Rightarrow$$

$$\#[([+\text{cons}])\begin{bmatrix}+\text{syll}\\+\text{long}\end{bmatrix}[+\text{syll}]([+\text{syll}])]_{N\#}$$

This rule lengthens the first vowel of nouns with the canonical shape described above.

Vowel Raising (VR)

$$\begin{bmatrix}+\text{syllabic}\\-\text{back}\\+\text{low}\\-\text{long}\end{bmatrix} \rightarrow [-\text{low}] / \_\_\_ C_0 \begin{bmatrix}+\text{syllabic}\\-\text{back}\\+\text{high}\end{bmatrix} \#$$

This rule raises short a to e (phonetically epsilon) when followed by i in word final position.

Vowel Copying (VC)

$$\begin{bmatrix}+\text{syllabic}\\-\text{back}\\+\text{low}\\-\text{long}\end{bmatrix} \rightarrow [-\text{low}] / \_\_\_ C_1 \begin{bmatrix}+\text{syllabic}\\-\text{back}\\-\text{low}\\-\text{long}\end{bmatrix} C_0 \begin{bmatrix}+\text{syllabic}\\-\text{back}\\+\text{high}\end{bmatrix} \#$$

This is a vowel harmony rule which raises a to e (phonetically epsilon). This is an approximation of this rule. Its precise nature is still not understood.

Final Vowel Deletion

$$V \rightarrow \emptyset / VC(V) \_\_\_ \#$$

Note that this rule does not delete the final vowel of monosyllables.

Based upon a large body of synchronic data, these rules appear to be well motivated. They are applied to the above base forms as follows:

	kiki	kiki+ni	langi	langi+ni	ata	ata+ni
CL	kiiki	--	laangi	--	aata	--
VR	--	--	--	--	--	atɛ+ni
VC	--	--	--	lɛngi+ni	--	ɛtɛ+ni
FVD	kiik	kiki+n	laang	lɛngi+n	aat	ɛtɛ+n
Sur.	kiik	kikin	laang	lɛngin	aat	ɛtɛn

These rules, in this order, generate the correct Ponapean surface forms. It would at first seem curious that compensatory lengthening is synchronically ordered prior to final vowel deletion. But, this is very likely the order in whihc these changes took place diachronically. Some western Trukic languages, Ulithian for example, still retain voiceless vowels in final position. This suggests that final vowels were first devoiced, compensatory lengthening then took place, and finally voiceless vowels were deleted.

A comparison of the base forms that have been postulated for the above nouns with their PO reconstructions illustrates that for at least some forms in the language, PO final vowels have been retained, although their quality may be modified. Thus:

PO Reconstruction	Ponapean Base
*kuku	kiki
*langi(t)	langi
*ansa(n)	ata

The problem is that synchronically it is probably not possible to postulate a final vowel for all bases where PO reconstructions suggest one. Indeed, as one would expect, final vowels appear to be retained only in those forms which take closely bound suffixes. Otherwise, final vowels are lost with subsequent restructuring of the lexicon. Thus, if one is to reconstruct to the level of the phonological base of Ponapean, a diachronic final vowel deletion is required which will account for this restructuring, and a synchronic final vowel deletion rule is necessary to generate correct surface forms for those items which do retain the final vowel. Unfortunately, too little is known about Ponapean to establish reliable base forms for all items cognate with Proto-Oceanic. The extent of restructuring that has taken place, then, remains unknown. It is consequently necessary in this paper to reconstruct, not to the base, but to an intermediate point of derivation approximatley equivalent to the level of the taxonomic phoneme.

4.0 PO SOURCES FOR PONAPEAN CONSONANTS

Following is an inventory of Proto-Oceanic consonants.[8]

	p	t	d	s	k	q
ngp	mp	nt	nd	ns	ngk	
ngm	m	n		ñ	ng	
	w	l	r	y	R	

Ponapean reflexes of these PO consonants will be presented in the following discussion. The procedure will be to discuss first the laryngeal *q, then the velar consonants, the coronal consonants, and finally the labial consonants. In addition, comments on glide insertion will be offered along with some observations on the source of initial consonant clusters in Ponapean. Lists of regular consonantal correspondences will not be exhaustive. Lists of exceptions will be.

4.1 The Laryngeal *q

*q in Ponapean, as probably in all other Micronesian languages, is reflected as ∅. Examples follow:

*qate	ɛɛ	'liver'
*qatop	ɔɔs	'thatch'
*maqudi(p)	movr	'life'
*nana(q)	naan	'pus'
*pituqu	usu	'star'
*saqit	teytey	'sew'
*quling	iliil	'steer'

In the following example, w appears to be a reflex of *q.

*quna(p)	winɛ	'fish scales (its)'

In section 4.5, however, it will be argued that this w can be accounted for by a glide insertion rule.

4.2 Velar Consonants

*k > k

*iku	iik	'tail'
*ka(Rdr)angpa	kapw	'new'
*kamu	komw	'you - honorific'
*kuku	kiik	'nail'
*kuli(t)	kiil	'skin'
*laki	laak	'penis'
*masaki(t)	mɛtɛk	'pain'
*puki	wik	'turn'
*puko	uuk	'net'
*sakan	sakan	'eat - honorific'

A single irregular reflex of *k occurs. *k > ∅.

*nsake	-ta	'upwards'

4.2.2 *ngk

*ngk > k

*ngkinit	kinii	'pinch'
*sangka(q)	tak	'ride (vehicle)'
*mpengka	pwɛɛk	'bat'

4.2.3 *R

*R > ∅ in seven cases.

*daRa(q)	nta	'blood'
*ka(Rdr)angpa	kápw	'new'
*kuRita	kiis	'squid'
*mauRi	mɛyng	'left'
*Ripa	mpɛ	'close (to it)'
*Ruap	uu	'tide'
*nsakaRu	tɛkɛ	'island'

Note that in all these cognates except the first two, *R is deleted before a high vowel. The first two forms, however, are also irregular in other respects. The initial segment in *daRa(q) should be nasal rather than oral grade to account for the retroflex in the Ponapean cognate. kapw from *ka(Rdr)-angpa should reflect a long vowel rather than a short one.

*R > -r in two cases.

*qapaRa	apɛrɛ	'shoulder (its)'
*meRa	mer	'rust'

Here, *R is preserved before *a. However, these cognates are also suspect. The first is archaic and is retained only in the highest honorific speech. Few speakers of Ponapean know this word. The second exhibits a semantic shift from PO 'reddish' to Ponapean 'rust'. Also, the construct form of this word is merin, reflecting the wrong reflex for the PO final vowel.

Thus, two positions may be taken with respect to *R. A claim might be made that *R deletes before high vowels only, with two possible exceptions, or one might argue that *R deletes everywhere also with two possible exceptions. It is impossible at this point to determine which hypothesis is correct.

4.2.4 *ng

*ng > ng

*angoango	ɔngɔɔng	'yellow'
*dongo	rong	'hear'
*langi(t)	laang	'sky'
*langɔ	lɔɔng	'fly'
*ngapulu(q)	ngowl	'ten'
*ngipo	ngii	'tooth'
*pang(ou)(n)	pangin	'awaken'
*sanga	taang	'thigh'
*talinga	salɛng	'ear'

4.3 Coronal Consonants

4.3.1 *s

*s > t

*asang	ɛtɛ	'gill (its)'
*masaki(t)	mɛtɛk	'pain'
*saqit	teytey	'sew'
*masawa	mataw	'open sea'
*sanga	taang	'thigh'
*sau(q)	too	'far off'
*solo	tool	'mountain'
*sulu	tiil	'torch'
*tusu	it	'point'
*sampo	tapatap	'catch'
*sili	til	'penetrate'

In two instances, *s > ∅.

*sala	aal	'road'
*suli	iil	'shoot, sucker'

In one unexplainable instance, *s > s.

*sakan	sakan	'eat - honorific'

4.3.2 *ns

*ns > t

*ansa(n)	aat	'name'
*nuns(io)	nuut	'squid'
*mansu(rR)	mɛt	'full'
*pinsiko	utuk	'flesh'
*nsama	taam	'outrigger'
*nsiwa	tuwa-	'nine'
*nsoka	tok	'stab'
*tansi(k)	seet	'sea'

In one case, *ns > ∅.

*nsangi	aang	'wind'

Thus, the regular reflex of both oral and nasal grade *s is t. In three instances, *(n)s > ∅. This sporadic deletion of *(n)s with no obvious phonological conditoning is apparently characteristic of Micronesian languages. It has also been reported for Kusaien, Mokilese, Trukese, and Ulithian.[9]

4.3.3 *d

*d > r

*-da	-ra-	'their'
*daqa(n)	raa	'branch, twig'
*dongo	rong	'hear'
*dua	ria-	'two
*nada	maar	'preserved breadfruit'
*matudu	mɛyr	'sleep'
*maqudi(p)	mowr	'life'
*madama	maram	'moon'

In two instances oral grade *d shows a nasal grade reflex.

*daʀa(q)	nta	'blood'
*(dl)iki	ṭ́ik	'small'

4.3.4 *r

*r > r

*iriR	irip	trans.	'fan'
	irir	intr.	'
*raku	raki		'scratch'

In addition, the following ambiguous cases occur.

*(dr)an(i)	raan	'day'
*(dr)on(st)o	rot	'dark'
*ka(dr)u	karu(pwut)	'scratch'
*pi(dr)i	pir	'twist'

This ambiguity is of no consequence, however, since in Ponapean both *d and *r are regularly reflected as r.

4.3.5 *nd

*nd > ṯ

*ndangma	ṯaamw	'forehead'
*ndamu	ṯamw(ɛ)	'lick'
*ndau	ṯɛɛ	'leaf'

4.3.6 *nt

*nt > ṯ

*(dr)on(st)o	roṯ	'dark'
*kinta	kiṯ-	'1st person pl.'
*muntu	mwuṯ	'pulverized'
*pinta	piiṯ	'split leaves of pandanus'
*punti	uuṯ	'banana'
*nta	-ṯa-	'our'

Thus, *nd and *nt have fallen together, the normal Ponapean reflex being ṯ.

4.3.7 *t

*t > s in these cases.

*tali	saal	'rope'
*talinga	salɛng	'ear'
*tama	saam	'father'
*tangi(s)	sɛng	'weep'
*tolu	sili-	'three'
*topu	seew	'sugar cane'
*qatop	ɔɔs	'thatch'
*mata	maas	'eye'
*ngmata	mwaas	'worm'
*nputo	pwuus	'navel'
*uto	uus	'float of fishing net'

*t > ∅ in the following examples.

*tupa	uup	'fish poison'
*tusu	it	'point'
*tuqu	uu	'stand'
*tumpu	ipw	'parentage'
*tina	iin	'mother'
*natu	nɛɛ	'poss. for children'
*matudu	mɛyr	'sleep'
*anitu	ɛni	'ghost'

The preceding forms illustrate that *t > ∅ before high vowels, and that elsewhere *t > s. This s reflex of *t, however, is probably a rather recent development. Luther Gulick, in a generally insightful article published in 1880, entitled "A Vocabulary of the Ponape Dialect,"[10] describes no s for Ponapean. Instead, he states: "...there is a series of variable and interchangeable sounds, including our 'g' soft or j, and the corresponding surd ch, and verging sometimes even upon sh and ts, for which the single character j is employed here, as being on the whole, the truest rendering of the entire group." All forms which he spells with j are in modern Ponapean pronounced with an s, which is phonetically palatalized. In Mokilese, the language most closely related to Ponapean, *t is still reflected as a voiceless palatal affricate. Thus, it seems reasonable to assume that in Ponapean, *t first went to a voiceless palatal affricate, and only within the past one hundred years developed the palatalized s.[11]

In two additional cases *t > ∅.

*qate	ɛɛ	'liver'
*mate	mɛɛ(la)	'die'

These forms would appear to be exceptions to the rule stated above that *t deletes only before high vowels. It may be, though, that e provides a special environment. There still remain these irregular reflexes of *t.

*tuki	suk	'pound'
*pitu	isi-	'seven'
*pituqu	usu	'star'

Here, *t is in an environment before a high vowel, but it has an s rather than a ∅ reflex. Other Micronesian languages also exhibit irregular reflexes of *t. Thus, as with the problems of *s, this may be a phenomenon of Proto-Micronesian rather than of Ponapean.

In a single instance, *t shows a nasal rather than the expected oral grade reflex.

*piti(k)	piţik	spring up'

4.3.8 *n

*n > n

*anitu	ɛni	'ghost'
*inu(m)	nim	'drink'
*manang	manaman	'spritual power'
*manu(k)	maan	'bird, animal'
*nana(q)	naan	'pus'
*niu(R)	nii	'coconut'
*pani	paan	'bait'
*tina	iin	'mother'

*n > ∅

*ponu	weey	'turtle'
*namu(k)	aamw	'bug'
*pan(i)	pɛɛ	'wing, arm (its)'
*tanum	sowsow	'grave'

Except for *pan(i), where one might assume *n was in final position, no plausible phonological conditioning may be established to account for the deletion of *n.

4.3.9 *l

*l > l

*alap	alɛ	'take'
*langi(t)	laang	'sky'
*lima	lima-	'five'
*limu	liimw	'moss, sponge'
*pili(q)	pil	'choose'
*mpulu(t)	pwiil	'gum'
*sala(n)	aal	'road'
*solo	tool	'mountain'
*tali	saal	'rope'
*tolu	sili-	'three'
*qulunga	ulung or uluul	'pillow'

This is a regular correspondence. There are no exceptions in the data.

4.4 Labial Consonants

4.4.1 *p

*p > p

*pa-	pey	'fight'
*pa-	pa-	'causative prefix'
*paqa	pa(ki)	'cut yams for planting'

*paqa	paa	'leaf'
*pada	-par	'pandanus'
*pakivak	pako	'shark'
*pan(i)	pɛɛ	'wing (its)'
*pang(ou)(n)	pangin	'awaken'
*pat	paa-	'four'
*pi(dr)i	pir	'spin, twist'
*pili(q)	pil	'choose'
*pali	pɛl	'respect'
*tupa	uup	'fish poison'

*p > ∅

*punti	uut	'banana'
*puko	uuk	'net'
*pua(q)	waa	'fruit'
*ngapulu(q)	ngowl	'ten'
*puki	wik	'turn'
*tapu-	sowi	'conch shell trumpet'
*topu	seew	'sugar cane'
*tapu(n)i	sow	'afterbirth'
*ponu	weey	'turtle'
*mapo	mo	'heal'
*nsipo	-ti	'downwards'
*ngipo	ngii	'tooth'

The Ponapean cognates containing *p listed above suggest that *p is lost before round vowels and is retained elsewhere. In some forms, it appears that *p > w; however, it will be argued in section 4.5 that the w in these forms occurs as a consequence of glide insertion.

The following two cognates present possible ordering arguments for the deletion of *p.

*pinsiko	utuk	'flesh'
*pituqu	usu	'star'

These forms suggest the existence of a vowel harmony rule, the effect of which was to back *i to u in concord with the final round vowel of the morpheme. *p, then in the proper environment, was deleted.

Now note this cognate:

*pitu	isi-	'seven'

This form suggests that the deletion of *p should precede the fronting of final short *u to i, a rule which will be discussed in section 5.1.2. Thus, Ponapean cognates of *pinsiko, *pituqu, and *pitu may have evolved as a consequence of these ordered rules.

PO Forms	*pinsiko	*pituqu	*pitu
Other Rules	pitiko	pisuu	pisu
Vowel Harmony	putuko	pusuu	pusu
p Deletion	utuko	usuu	usu
Short *u → i/___#	--	--	usi
Vowel Harmony	--	--	isi-
Final Vowel Del.	utuk	usu	--
Surface Form	utuk	usu	isi-

(Vowel harmony is allowed to apply twice here; therefore, it is assumed that this rule is older that p deletion and u fronting and still existed in the grammar at the time these rules applied.)

This may be a plausible way to account for these forms. Vowel harmony and the fronting of final short u are reasonably well established facts about the history of Ponapean phonology. Appeal to these rules will also be made when discussing prothetic w in section 4.5. But, the ordering presented above is based on too few forms to be very convincing. Further, those forms containing *t above are irregular in another respect. *t should have deleted. And, there still remains in the data one instance of *p deleting before *i that cannot be accounted for.

*api	aay	fire

If *p does in fact sporadically delete before i, then the previous discussion is somewhat suspect.

4.4.2 *ngp

*ngp > pw

*ka(Rdr)angpa	kapw	'new'
*ngpongi	pwoong	'night'

Only these two cases occur in the data.

4.4.3 *mp

*mp > pw

*mpo-	pwoo	'smell'
*mpou	mwpwey	'gall bladder'
*mpua	pwuu	'betel nut'
*mpule	pwili	'cowry shell'
*mputo	pwuus	'navel'
*mpengka	pwɛɛk	'bat'
*mpou	pwow	'fishing pole'

Two exceptions occur:

*mponot	pon	'blocked'
*sampo	tapatap	'catch'

No obvious explanation suggests itself for these irregular reflexes. They illustrate again the problem of oral/nasal grade contrast in PO.

4.4.4 *m

*m > m

*lima	lima-	'five'
*mada	maar	'preserved breadfruit'
*manu(k)	maan	'bird, animal'
*mata	maas	'eye'
*mauRi	mɛyng	'left'
*nsama	taam	'outrigger'
*mansu(rR)	mɛt	'full'
*tama	saam	'father'
*maqudi(p)	movr	'life'

*m > mw

*kamu	komw	'you - honorific'
*limu	liimw	'moss, sponge'
*-mu	-mw	'your - sg.'
*qumu	uumw	'earth oven'
*namo	naamw	'lagoon'

Thus, *m is reflected as mw before round vowels and as m elsewhere.

4.4.5 *ngm

*ndangma	ṭaamw	'forehead'
*ngmao	mvaang	'taro'
*ngmata	mwaas	'worm'
*Rungma(q)	iimw	'house'

No exceptions occur here. *ngm > mw.

4.4.6 *w

*w > w

*awang	aaw	'mouth'
*nsiwa	tuwa-	'nine'
*walu	vɛli-	'eight'
*wawa	waawa	'nephew relationship'
*masawa	mataw	'open sea'

In a single instance, *w is reflected as ∅.

*pakiwak	pako	'shark'

This cognate will be further discussed in section 5.1.1.

4.5 Glide Insertion

Glides in Ponapean originate from three possible sources -- from proto-glides (in the case of *w), from *i or *u, or from glide insertion. In this section of the paper, only those glides which occur as a consequence of insertion are to be considered.

As has already been suggested in section 2.3, one glide insertion rule is the following.

$$\begin{bmatrix}+\text{syllabic}\\-\text{high}\end{bmatrix}\begin{bmatrix}+\text{syllabic}\\+\text{high}\\\alpha\text{back}\\\beta\text{round}\end{bmatrix} \Rightarrow \begin{bmatrix}+\text{syllabic}\\-\text{high}\end{bmatrix}\begin{bmatrix}-\text{syllabic}\\+\text{high}\\\alpha\text{back}\\\beta\text{round}\end{bmatrix}\begin{bmatrix}+\text{syllabic}\\+\text{high}\\\alpha\text{back}\\\beta\text{round}\end{bmatrix}$$

This rule inserts $\begin{bmatrix}y\\w\end{bmatrix}$ between a non-high vowel and $\begin{bmatrix}i\\u\end{bmatrix}$ #.

Examples follow:

*api	aay	'fire'
*mpou	pwow	'fishing pole'
*topu	seew	'sugar cane'
*saqit	teytey	'sew'
*tanum	sowsow	'grave'

That is, after the deletion of appropriate consonants, glides are inserted and the final vowel is deleted.

The principal basis of this argument is that within a generative framework it is synchronically necessary to preserve the final vowel of at least some of these forms in order to account for morphophonemic alternation. Thus, aay 'fire' occurs in a compound as (kisini)ɛy (lit. bit-of-fire) meaning 'a fire, as for cooking'. Only syllabic i can raise short a to ɛ; therefore, a base ai must be postulated to account for the elicitation form, which undergoes compensatory lengthening, and the compound form which does not. Glide insertion is thus required synchronically; the extent to which it is necessary diachronically is unclear since, as was explained previously, it is not known to what extent final vowels have been preserved in the base.

In three instances the preceding rule seems to give the wrong result.

*mpou	mwpwey	'gall bladder (its)'
*tapu-	sɛwi	'conch shell trumpet'
*ponu	weey	'turtle'

Note, however, that the first two forms are morphologically complex. mwpwey is possessed and sɛwi occurs in PO as a bound stem. It is not immediately obvious, though, how these affixes interact with the stem to produce the glide they do. The third form, *ponu > weey is aberrant in a number of respects, and remains without explanation.

Prothetic w also occurs as a consequence of glide insertion. Note these examples:

*eno	wen-	'lie down'
*onom	wene-	'six'
*ponu	weey	'turtle'
*quna	winɛ	'feathers, scales (its)'
*puki	wik	'turn'

If one assumes that in the first form, *e was backed to o in harmony with the final vowel, that in the last three forms initial *p and *q were deleted (recall that *p deletes before round vowels), then one may postulate that w was inserted between # and round vowels. Later developments then unrounded these vowels.

Synchronically prothetic w is preserved only before non-round segments. Thus:

*puko	uuk	'net'
*pinsiko	utuk	'flesh'
*Ruap	uu	'tide'
*tupa	uup	'fish poison'
*pituqu	usu	'star'
*qulung	ulung	'pillow'
*punti	uut	'banana'

There is still some instability in Ponapean between initial wi and initial u. The word for 'lobster', for example, is alternately pronounced wirɛnna or urɛnna, apparently in free variation.

4.6 Initial Consonant Clusters

There are four instances of initial consonant clusters in the data.

*muta(q)	mwmwus	'vomit'
*daRa(q)	nta	'blood'
*mpou	mwpwey	'gall bladder (its)'
*Ripa	mpɛ	'close (to him)'

As Goodenough suggested in his article The Long or Double Consonants or Trukese[12] these occurrences of initial consonant clusters probably reflect older forms with first syllable reduplication. Comparing the first two items with Gilbertese and Trukese, one finds:

Gilbertese	Trukese	Ponapean
MuMuta	bbus	mwmwus
raraa	cca	nṯa

Trukese and Ponapean both delete the first vowel in the reduplicated syllable, thus producing geminate consonants. In Ponapean, however, still another rule applies. Synchronically, this rule is very general; in effect, if two adjacent homorganic consonants occur, the second of which is voiceless, the first becomes a homorganic nasal. This rule then accounts for nṯa from ṯṯa. What the precise nature of this rule was diachronically is not yet known.

4.7 A Summary of Regular Consonantal Reflexes

Final Consonant Deletion	C > Ø/___#
Laryngeals	*q > Ø
Velars	*k, *ngk > k
	*ng > ng
	*R > Ø in seven cases r in two cases
Coronals	*s, *ns > t
	*d, *r > r
	*nd, *nt > t
	*t > Ø/___high vowels s/elsewhere
	*n > n
	*l > l
Labials	*p > Ø/___round vowels p/elsewhere
	*ngp, *mp > pw
	*m > mw/___round vowels m/elsewhere
	*ngm > mw
	*w > w
Glide Insertion Rules	See section 4.5.

5.0 PO SOURCES FOR PONAPEAN VOWELS

Five vowels are postulated for Proto-Oceanic. These are *i, *e, *a, *o, and *u. Ponapean reflexes of these PO vowels will be presented in the following discussion. First, the high vowels will be examined, then the mid vowels, and finally the low vowel a. As in the discussion of consonants, lists of regular correspondences will not be exhaustive, but lists of exceptions will.

5.1 High Vowels

5.1.1 *i

*i > i

*ia	ii	'he, she, it - emphatic'
*iriR	irip	'fan'
*ngkinit	kinii	'pinch'
*kinta	kiṭ-	'we'
*lima	lima-	'five'
*pinta	piiṭ	'split leaves of pandanus'
*piti(k)	piṭik	'spring up'
*tina	iin	'mother'
*(dl)iki	ṭik	'small'
*anitu	ẽni	'ghost'
*iku	iik	'tail'
*limu	liimw	'moss, sponge'
*niu	nii	'coconut'
*pitu	isi-	'seven'

*i > ɛ

*talinga	salɛng	'ear'

In this instance, *i → ɛ/aC___Ca. This rule can also be used to explain the following odd form.

*pakiwak	pako	'shark'

After the application of the preceding rule and the deletion of the final consonant and vowel, the intermediate form pakɛw occurs. A synchronic fact of Ponapean is that ɛw alternates with ow and sometimes o. This alternation, then, might account for the form pako.

In two instances, *i > u.

*pinsiko	utuk	'flesh'
*pituqu	usu	'star'

A possible explanation for why u occurs in these forms, but not in a form like isi- from *pitu, has already been presented in section 4.4.1 under the discussion of the loss of *p.

In a single instance, *i > ∅.

*inu(m)	nim	'drink'

5.1.2 *u

*u > u

*tuqu(d)	uu	'stand'
*qulunga	ulung	'pillow'
*muta(q)	mwmwus	'vomit'
*tupa	uup	'fish poison'
*mpua	pwuu	'betel nut'
*quda	urɛ(nna)	'lobster'
*puko	uuk	'net'
*mputo	pwuus	'navel'
*uto	uus	'float of fishing net'
*nuns(io)	nuut	'squid'

Note that in these examples, *u > u in those cases where the vowel is inherently long, as in the first form after the deletion of *q, or where the stem final vowel is *a or *o. This observation lends further credibility ot the argument developed in section 4.4.1, and referred to above, where it was hypothesized that high back vowels remained back in stems ending in short non-high vowels.

In cases where the final vowel of the reconstructed form is high, the situation is more complex. Note these examples where the final vowel is *i.

*kuli	kiil	'skin'
*puki	wik	'turn'
*suli	iil	'shoot, sucker'
*quling	iliil	'steer'
*mudi	mwiri	'after (it)'

Here, *u is reflected as i. This can be attributed to vowel harmony of the type previously discussed in this paper.

Now note the following forms where the final vowel is *u.

*kuku	kiik	'nail'
*matudu	mɛyr	'sleep'
*mpulu(t)	pwiil	'gum, glue'
*sulu	tiil	'torch'
*tumpu(q)	ipw	'parentage'
*tusu(k)	it	'point'

If one assumes that short *u → i/___#, then vowel harmony will again explain the fronting of non-final u to i. Based on synchronic evidence, the fronting of final *u is a reasonable hypothesis. (See section 3.2) Further support for the position that short *u was fronted to i in final position is provided by forms like these.

*walu	wɛli-	'eight'
*pitu	isi-	'seven'

In these forms, which were free in PO but only occur affixed in Ponapean, the final vowel is clearly preserved as i.

In two cognates, *u fronts to i even though it is not in final position.

*inu(m)	nim	'drink'
*pang(ou)(n)	pangin	'awaken'

Two explanations suggest themselves here. It may be that *u fronts to i even if an intervening non-round segment occurs, or more likely, the final consonants here, which should have deleted, are analyzed as being thematic and not as part of the stem itself.

All the preceding high vowel reflexes, then, might be accounted for by these two rules.

Vowel Harmony

$$\begin{bmatrix}+\text{syllabic}\\-\text{low}\end{bmatrix} \rightarrow \begin{bmatrix}\alpha\text{back}\\ \beta\text{round}\end{bmatrix} / \_\_\_ [+\text{cons}] \begin{bmatrix}+\text{syllabic}\\-\text{low}\\ \alpha\text{back}\\ \beta\text{round}\end{bmatrix}$$

*u Fronting

$$\begin{bmatrix}+\text{syllabic}\\+\text{high}\\+\text{back}\end{bmatrix} \rightarrow \begin{bmatrix}-\text{back}\\-\text{round}\end{bmatrix} / \_\_\_ \#$$

Vowel harmony is probably the older of these two rules, and very likely applied both before and after the fronting of *u. Again, I refer the reader to section 4.4.1 for examples of this position.

As one would expect, there are exceptions to these rules.

*qumu	uumw	'earth oven'
*muntu	mwut	'pulverized'
*punti	uut	'banana'

*tuki	suk	'pound'
*Rungma	iimw	'house'
*dua	ria-	'two'
*nsiwa	tuwa-	'nine'

In the first four forms (assuming the fronting of final *u) the vowel harmony rule does not apply. Even synchronically, though, vowel harmony (or copying) is a very complex phenomenon, the precise nature of which is not understood. The fronting of *u in the fifth and sixth forms is also unexplainable. The last form, though, might be explained by the fact that iw is synchronically an impermissable sequence; thus, *i was probably backed to u as a consequence of this constraint.

5.1.3 Glide Formation

PO high vowels become glides in the following items.

*matudu	mɛyr	'sleep'
*maqudi(p)	mowr	'life'
*ngapulu	ngowl	'ten'
*pua(q)	waa	'fruit'

A comparison of the first three forms suggests that rules affecting *t are more recent than the loss of *q or *p. Assuming a glide formation rule: $\begin{bmatrix}+\text{syllabic}\\-\text{high}\end{bmatrix} \rightarrow$ [-syllabic]/ $\begin{bmatrix}+\text{syllabic}\\-\text{high}\end{bmatrix}$___[-syllabic] then the following rule ordering would explain these forms.

PO Reconstructions	matudu	maqudi	ngapulu
*q → ∅	--	maudi	--
Glide Formation	--	mawdi	--
*p → ∅/___round V	--	--	ngaulu
Glide Formation	--	--	ngawlu
*u → i/___#	matudi	--	ngawli
Vowel Harmony	matidi	--	--
*t → ∅/___high V	maidi	--	--
Glide Formation	maydi	--	--
Other Rules	mɛyr	mowr	ngowl

Note that the glide formation rule has been allowed to apply whenever the conditions are correct. This, in essence, is claiming that this is a rule which has been in the language for a long time. Also note that the ordering here is consistent with ordering arguments presented elsewhere in this paper. It should not be assumed, however, that rules subsumed under "Other Rules" are ordered in this position. Rather, since these rules are not directly relevant to the argument, they are grouped together to avoid obscuring the presentation.

The fourth form, waa from *pua(q), can be explained by a glide formation rule of this nature.

$$\begin{bmatrix}+\text{syllabic}\\+\text{high}\end{bmatrix} \rightarrow [-\text{syllabic}]/\#\_\_ \begin{bmatrix}+\text{syllabic}\\-\text{high}\end{bmatrix}$$

If one takes the position that juncture has a minus value for all distinctive features that apply to segments, then the two glide formation rules presented here can be written as a single mirror image rule.

$$\begin{bmatrix}+\text{syllabic}\\+\text{high}\end{bmatrix} \rightarrow [-\text{syllabic}] \; \% \; \begin{bmatrix}+\text{syllabic}\\-\text{high}\end{bmatrix} \_\_ [-\text{syllabic}]$$

5.2. Mid Vowels

5.2.1 *e

There are relatively few non-final occurrences of *e.

*eno	wen(ti)	'lie down'
*kiekie	kiɛ	'possessive for mat'
*mpengka	pwɛɛk	'bat'

These forms support the position taken in section 2.3 of this paper that *e is realized as e when followed by a high non-con sonantal segment, and that elsewhere *e > ɛ. The first item, for example, when followed by the suffix -to, is pronounced wɛnto.

In a single instance, *e > a.

*katea	kasa	'side of canoe opposite outrigger'

Based on a single example, one might hypothesize that ea > aa.

There are additionally two questionable cognates containing *e.

*meRa	mer	'rust'
*pengu	pɛngi(tɔy) pangit'	'blow the nose'

The construct form of the first word is merin, thus reflecting the wrong final vowel (and explaining the occurrence of e rather than ɛ.) In the second item, a better reconstruction for the Ponapean form would seem to be *pangu.

5.2.2 *o

*o > o

*(dr)on(st)o	rot	'dark'
*dongo	rong	'hear'
*mpo-	pwoo	'smell'
*ngpongi	pwoong	'night'
*mpou	pwow	'fishing pole'
*nsoka	tok	'stab'
*toko(n)	sokon	'cane'

*o > e/ɛ

*topu	seew	'sugar cane'
*ponu	weey	'turtle'
*ko(e)	kɛ	'you - sg.'
*mpou	mwpwey	'gall bladder (its)'
*onom	wene-	'six'

The fronting of *o to e or ɛ apparently involves vowel harmony, but since the precise nature of vowel harmony is not understood, it is difficult to systematically account for these forms. The last cognate also suggests that final *o was fronted to e, but this cannot be justified by synchronic data. More likely, final *o was lost; for example, the vowel that appears in the construct form of a noun like roong 'news' (from *dongo 'hear') is just an insert vowel. Thus, one may say either rongin or rongɛn. Both forms are acceptable.

In two instances, *o becomes a high vowel.

*tolu	sili-	'three'
*matolu	mosul	'thick'

In both instances, *o is between s and l, which are phonetically palatalized. This palatalization probably accounts for the raising, but the motivation for the front/back differences here is again not very clear. In general, reflexes of mid vowels are not very well understood, principally because there are relatively few forms to work with.

5.3 *a

*a > ɔ

*angoango	ngɔɔng	'yellow'
*qatop	ɔɔs	'thatch'
*lango	lɔɔng	'fly'

These three forms illustrate what was apparently an early development affecting *a; that is, *a → ɔ/__Co. Note that this rule precedes compensatory lengthening. (The long vowel in ɔngɔɔng is a consequence of reduplication rather than lengthening.) Unfortunately, there are only three examples of this rule, and almost as many exceptions. Thus

*namo	naamw	'lagoon'
*sampo	tapatap	'catch'

The second of these items, though, may not be a good cognate. *mp should have been reflected as a velarized, not a plain, labial.

In the following forms, *a is reflected as a.

*-da	-ra-	'their'
*daRa(q)	nta	'blood'
*dua	ría-	'two'
*kaka	kaaka	'respect'
*lima	lima-	'five'
*madama	maram	'moon'
*manang	manaman	'spritual power'
*masawa	mataw	'sea'
*pua(q)	waa	'fruit'
*-nta	-ta-	'our'

Note that in all of the above Ponapean cognates a is short, except as a consequence of reduplication or compensatory lengthening. Note also that in the PO reconstructions, *a is followed by no vowel except *a.

In these forms, after the deletion of the final consonant if present, the final vowel is *i. Note that *a raises to ɛ.

*manipi(s)	mɛnipinip	'thin'
*masaki(t)	mɛtɛk	'pain'
*pali	pɛl	'respect'
*mauRi	mɛyng	'left hand'
*saqit	tɛɛk	'sew'
*tangi(s)	sɛng	'weep'

The following forms are all possessed nouns. Synchronically the third person possessive suffix is -i.

*qapara	apɛr	'shoulder (its)'
*asang	ɛtɛ	'gill (its)'
*pan(i)	pɛɛ	'wing (its)'

Thus, the raising here might be attributed to the presence of an -i suffix, which is deleted on the surface.

The following items also exhibit the raising of *a to ɛ, but the final vowel is *u.

*anitu	ɛni	'ghost'
*mansu(rR)	mɛt	'full'
*matudu	mɛyr	'sleep'
*natu	nɛɛ	'poss. for child'
*nsakaRu	tɛkɛ	'island'
*walu	wɛli-	'eight'

If the raising of a to ɛ is ordered after the fronting of u to i, then these forms, too, illustrate regular reflexes of *a. This a raising rule can now be formulated as follows:

$$\begin{bmatrix}+\text{syllabic}\\+\text{low}\\-\text{long}\\-\text{back}\end{bmatrix} \rightarrow [-\text{low}] / \_\_ C_0 \begin{bmatrix}+\text{syllabic}\\+\text{high}\\-\text{back}\end{bmatrix} \#$$

This rule states that short a (probably a front vowel at this point as a consequence of the introduction of ɔ) raises to ɛ when followed by any number of consonants and i in final position. Final position appears to be important based on forms like this one.

*pang(ou)(n)	pangin	trans.	'awaken'
	mpɛng	intr.	

There are diachronically few cases which support the importance of final position, but synchronically it is clearly important. Additionally, a vowel copying rule is needed to account for the raising of the first a in forms like ɛtɛ 'gill' (its), mɛtɛk 'pain', etc. (See section 2.3 for further comments on this rule.)

The following items illustrate that a raising should also be ordered after compensatory lengthening.

*api	aay	'fire'
*ansa(n)	aat	'name'
*awang	aaw	'mouth'
*daqa(n)	raa	'branch, twig'
*laki	laak	'penis of adult'
*langi(t)	laang	'sky'
*manu(k)	maan	'bird, animal'
*namu	aamw	'bug'
*pani	paan	'bait'
*sala(n)	aal	'road'
*nsama	taam	'outrigger'
*tali	saal	'rope, cord'
*tama	saam	'father'

Note that a raising affects only short vowels. Thus, if this rule is ordered after lengthening, even if a final high vowel occurs, the rule cannot apply.

There are instances, though, where a raises to o under the influence of final *u.

*kamu	komw	'you - honorific'
*ngapulu(q)	ngowl	'ten'
*tanum	sowsow	'grave'
*tapu-	sowi	'conch shell trumpet'
*tau	sow-	'practitioner of'
*taqu	sow(npar)	'year'

In each of these examples, note that o precedes either a velarized consonant or w. It is difficult to know just what the significance of this is. It may be that *u did not front in this environment, and thus raised *a to o, or possibly, where *u was final it did front with subsequent raising of *a to ɛ, but ɛ backed to o before mw or w.

In two cases, *a is reflected as e.

*tansi(k)	seet	'sea'
*pa-	pey	'fight'

Apparently this vowel occurs as a consequence of restructuring of the lexicon. The most common word for 'sea' in Ponapean is nanset (lit. in-sea). The elicitation form seet was probably formed from the compound form, thus set after compensatory lengthening became seet. pey has no related forms where alternation would provide evidence for *a. Thus, synchronically perhaps these two forms occur in the base as sɛti and pɛi. Diachronically, then, the raising of a to ɛ occurred, and since synchronically ɛ is the vowel of the base and a high segment follows, ɛ raises to e.

These unexplained cognates remain:

*mate	mɛɛ(ia)	'die'
*mapo	mo	'heal'
*sau(q)	too	'far off'
*qate	ɛɛ	'liver'
*ndau(n)	tɛɛ	'leaf'
*mataku(t)	masak	'afraid'
*matolu	mosul	'thick'
*ka(Rdr)angpa	kapw	'new'

In each of these forms, an unexpected reflex of *a occurs, either in terms of height, frontness, or length. Possible explanations for each of these forms could be offered, but they would be ad hoc to an extreme.

5.4 A Summary of Regular Vowel Reflexes

Only regular reflexes of PO vowels will be listed here. Conditioning will be stated in terms of the rules that have been previously discussed.

High Vowels

*i	> u	Vowel Harmony
	ɛ	i Lowering
	y	Glide Formation
	i	Elsewhere
*u	> i	u Fronting and Vowel Harmony
	w	Glide Formation
	u	Elsewhere

Mid Vowels

*e	> e	ɛ Raising
	ɛ	Elsewhere
*o	e/ɛ	Vowel Harmony?
	o	Elsewhere

The Low Vowel *a

*a	> ɔ	a Backing
	ɛ	a Raising
	o	conditioning not clear
	a	Elsewhere

Other Rules Affecting Vowels

Compensatory Lengthening
Final Vowel Deletion

6.0 CONCLUDING COMMENTS

The purpose of this paper has been to present some preliminary observations on the history of Ponapean phonology. Like most studies of this nature, however, the comments here have raised perhaps as many questions as they have answered. Certainly, there are many forms in Ponapean that appear to be cognate with Proto-Oceanic that cannot be systematically accounted for by the sound change rules that have been herein proposed. These difficulties cannot be eliminated, but their possible sources ought to be considered, for they suggest future areas of research.

Obviously, a better understanding of synchronic phonological phenomena in Ponapean would lead to improved diachronic hypotheses.

The restraints on vowel harmony, for example, and the extent of final vowel retention, if known, would almost certainly eliminate some of the difficulties involved in establishing Ponapean reflexes for PO vowels.

Arguments concerning rule ordering, too, need to be better developed and more thoroughly tested. In this paper, a number of arguments concerning ordering have been suggested, but unfortunately, these too often are based on only a few cognates. Ideally, a list of PO reconstructions should be presented in conjunction with a sequence of ordered rules which would correctly predict current Ponapean forms.

Probably another source of difficulty is that false cognates have been taken into consideration in formulating sound change rules. Because of the preliminary nature of this study, however, all items which might reasonably be considered cognate have been included. The elimination of some of the more troublesome forms would certainly produce neater results, but it is impossible at this stage of research, and perhaps at any stage, to establish the kind of precise criteria that would be necessary to insure that only true cognates were considered.

FOOTNOTES

1. Other languages spoken in Ponape District are Mokilese, Kusaiean, Nukuoro, and Kapingamarangi. The first two of these languages are Micronesian; the second two are Polynesian.
2. The adoption of the Main dialect as a basis for spelling was made official in January, 1972 at an orthography conference conducted by the author. In practice, this procedure is much older.
3. Garvin, n.d., pp. 8-9.
4. A taxonomic inventory of Ponapean consonants would be identical.
5. Garvin, n.d., p.5
6. A single l-r exception occurs; that is luur 'shrimp'. Four n-ng exceptions have been found, but these are all of the canonical form ..ngVn.. . What the significance of this is, is not clear.
7. The construct form ni occurs without the final vowel being deleted in compounds like kisi-ni-ɛy (lit. bit-of-fire) meaning 'a fire, as for cooking.'
8. Grace, (Micronesian Seminar, University of Hawaii, Fall 1971, Spring 1972)
9. Micronesian Seminar, Spring 1972.
10. Gulick, 1880, p. 97.
11. Damian Sohl, a native speaker of Ponapean, reports having heard older speakers of Ponapean still using the voiceless palatal affricate. (personal communication)
12. Goodenough, 1963, p. 78.

ACKNOWLEDGMENTS

I am indebted to Mr. Damian Sohl who provided the data for this paper. I also wish to thank him, along with George Grace, Irwin Howard, and fellow participants in the Micronesian Seminar, for the many helpful comments I received concerning the analysis of this data. I, of course, accept final responsibility for all errors.

REFERENCES

Blust, R. 1972. Proto-Oceanic addenda. WPL, University of Hawaii 4, no. 1.1-43.

Dyen, I. 1949. On the history of Trukese vowels. Lg. 25. 429-436.

Dyen, I. 1965. A sketch of Trukese grammar. Essay Number 4, American Oriental Society, New Haven.

Garvin, P. n.d. A linguistic study of Ponape, CINA 1947-49. Unpublished Manuscript.

Goodenough, W. 1963. The long or double consonants of Trukese. The Proceedings of the Ninth Pacific Science Congress, 1957, 3. 77-80.

Grace, G. 1969. A Proto-Oceanic finder list. WPL, University of Hawaii 2, 39-84.

Grace, G. n.d. Some Trukese cognates. (from Dyen) University of Hawaii, mimeo.

Gulick, L. 1880. A vocabulary of the Ponape dialect. Ponape-English and English-Ponape. American Oriental Society Journal 10.1-109.

Proto-Oceanic/Ponapean Cognates

Proto-Oceanic		Ponapean	
1.	-qaki 'cause or instrument suffix'	-ki-	'instrumental suffix'
2.	alap 'take'	alɛ	'take'
3.	anitu 'ghost'	ɛni	'ghost'
4.	qapaRa 'shoulder'	apɛrɛ	'shoulder (its)'
5.	api 'fire'	aay	'fire'
6.	ansa(n) 'name'	aat	'name'
7.	asang 'gill, fin'	ɛtɛ	'gill (its)'
8.	qate 'liver'	ɛɛ	'liver (its)'
9.	qatop 'thatch, sago palm'	ɔɔs	'thatch, sago palm'
10.	awang 'open space, mouth'	aaw	'mouth'
11.	-da 'their'	-ra-	'their'
12.	daqa(n) 'branch, twig'	raa	'branch, twig'
13.	ndangma 'forehead'	taamw	'forehead'
14.	ndamu 'chew, lick'	́tamwɛ	'lick'
15.	(dr)an(i) 'day'	́raan	'day'
16.	daRa(q) 'blood'	nta	'blood'
17.	ndau(n) 'leaf'	t́ɛɛ	'leaf'
18.	(dl)iki 'small'	́tik	'small'
19.	(dr)on(st)o 'night'	́rot	'dark'
20.	dongo 'hear'	ró́ng	'hear'
21.	dua 'two'	ria-	'two'
22.	eno 'lie down'	wen(ti)	'lie down'
23.	iku 'tail'	iik	'tail'
24.	inu(m) 'drink'	nim	'drink'
25.	iriR 'to fan'	irip irir intr.	trans. 'to fan'
26.	ka(dr)u 'scratch'	karu(pwut)	'scratch'
27.	ka(Rdr)angpa 'new'	kapw	'new'
28.	kaka 'older sibling of same sex'	kaaka	'respect of elders'
29.	kamu 'ye'	komw	'ye-honorific'
30.	katea 'side of canoe opposite outrigger'	kasa	'side of canoe opposite outrigger'
31.	kiekie 'pandanus'	kiɛ	'poss. for mats'
32.	ngkinit 'pinch'	kinii kinikin intr.	trans. 'pinch
33.	kinta 'first person inclusive pronoun'	kit-	'first person pl. stem'
34.	ko(e) 'thou'	kɛ	'you-sg.'
35.	kuku 'claw, nail'	kiik	'nail'
36.	kuli(t) 'skin, bark'	kiil	'skin, bark'
37.	kuRita 'octupus'	kiis	'octupus'
38.	laki 'male, adult'	laak	'penis of adult'
39.	langi(t) 'sky'	laang	'sky'
40.	lango 'a fly'	lɔɔng	'a fly'

	Proto-Oceanic	Ponapean
41.	(ln)ima 'bail'	lim 'bail'
42.	lima 'five'	lima- 'five'
43.	limu 'seaweed, moss'	liimw 'moss, sponge'
44.	maa 'be ashamed'	maak 'be ashamed'
45.	mada 'fermented, ripe'	maar 'preserved breadfruit'
46.	madama 'moon'	maram 'moon'
47.	ngmalala 'cleared ground'	mall 'clear grassy spot'
48.	manang 'power, wind'	manaman 'spritual power'
49.	manipi(s) 'thin'	mɛnipinip 'thin'
50.	manu(k) 'bird, animal'	maan 'bird, animal'
51.	ngmao 'taro'	mwaang 'taro'
52.	mapo 'to heal'	mo 'to heal'
53.	masaki(t) 'sick, pain'	mɛtɛk 'pain'
54.	masawa 'shore, sea'	mataw 'open sea'
55.	mata 'eye'	maas 'eye'
56.	ngmata 'snake, worm'	mwaas 'worm'
57.	mataku(t) 'afraid'	masak 'afraid'
58.	mansu(rR) 'plenty of food'	mɛt 'full of food'
59.	mate 'die	mɛɛ(la) 'die'
60.	matolu 'thick'	mosul 'thick'
61.	matudu(R) 'sleep'	mɛyr 'sleep'
62.	mauRi 'left (hand)'	mɛyng 'left'
63.	maqudi(p) 'life'	mowr 'life'
64.	meRa 'reddish'	mer 'rust'
65.	-mu 'your-sg.'	-mw 'your-singular'
66.	mudi 'behind'	mwiri 'behind, after (it)'
67.	muta(q) 'to spit, vomit'	nwmwus 'vomit'
68.	muntu 'severed, cut short'	mwut 'anything pulverized'
69.	namo 'lagoon'	naamw 'lagoon'
70.	namu(k) 'mosquito'	aamw 'bug' amwi(sɛ) 'mosquito
71.	nana(q) 'pus'	naan 'pus'
72.	niu(R) 'coconut'	nii 'coconut'
73.	natu 'child, offspring'	nɛɛ 'poss. for child'
74.	nuns(io) 'squid'	nuut 'squid'
75.	ngapulu(q) 'ten'	ngowl 'ten'
76.	ngipo 'tooth'	ngii 'tooth'
77.	onom 'six'	wene- 'six'
78.	pa- 'fight'	pey 'fight'
79.	pa- 'causative prefix'	pa- 'causative prefix'
80.	paqa 'stem of ensiform leaves'	pa 'leaf including stem'
81.	paqa 'cut yams for planting'	pa(ki) 'cut yams for planting'
82.	pada 'pandanus'	(ki)par 'pandanus'
83.	pakiwak 'shark'	pako 'shark'
84.	pali 'respect'	pɛl 'respect'
85.	pan(i) 'wing'	pɛɛ 'wing, arm (its)

	Proto-Oceanic	Ponapean
86.	pani 'bait'	paan 'bait'
87.	papa 'downwards'	paa 'downwards'
88.	pang(ou)(n) 'awaken'	pangin 'awaken'
89.	pat 'four'	paa- 'four'
90.	mpengka 'bat'	pwɛɛk 'bat'
91.	pengu 'blow the nose'	pangit trans. pɛngi(tɔy) intr. 'blow the nose'
92.	pi(dr)i 'fold, twist'	pir 'spin, turn'
93.	pili(q) 'select, choose'	pil 'choose'
94.	pinsiko 'flesh'	utuk 'flesh'
95.	pinta 'split'	piit 'split leaves of pandanus'
96.	piti(k) 'spring up'	pitík trans. pit́ intr. 'spring up'
97.	pitu 'seven'	isí- 'seven'
98.	pituqu 'star'	usu 'star'
99.	mpo- 'to smell'	pwoo 'smell'
100.	mponot 'blocked'	pon 'blocked'
101.	ponu 'turtle'	weey 'turtle'
102.	ngpongi 'night'	pwoong 'night'
103.	pua(q) 'fruit'	waa 'fruit'
104.	mpua 'areca nut'	pwuu 'areca nut'
105.	mpule 'cowry shell'	pwili 'cowry shell'
106.	puki 'return'	wikit trans. wik intr. 'to turn'
107.	mpulu(t) 'gum, glue'	pwiil 'gum, glue'
108.D	puko 'net'	uuk 'net'
109.D	punti 'banana	uut́ 'banana'
110.	mputo 'navel'	pwuus 'navel'
111.	raku 'scratch'	raki trans. rɛkirɛk intr. 'scratch'
112.	Ripa 'go close'	mpɛ 'close (to him)'
113.	Ruap 'rising tide'	uu 'tide'
114.	Rungma(q) 'house'	iimw 'house'
115.	saqit 'sew'	tɛɛk trans. teytey intr. 'sew'
116.	sakan 'cooking and everything associated with it'	sakan trans. sak intr. 'eat-honorific'
117.	sala(n) 'road, path'	aal 'road, path'
118.	nsama 'outrigger'	taam 'outrigger'
119.	sampo 'catch'	tapɛr trans. tapatap intr. 'catch'
120.	sanga 'thigh'	taang 'thigh'
121.	sangka(q) 'to hop'	takɛ 'ride (a vehicle)'
122.	nsangi 'wind'	aang 'wind'
123.	nsakaRu 'reef, sandbank'	tɛkɛ 'island'
124.	nsake 'upwards'	ta 'upwards'
125.	nsapa 'what'	ta 'what'

126.	sau(q) 'outside, far off'	too 'far off'
127.	(s)ida 'they'	ir- 'they'
128.	nsipo 'downwards'	-ti 'downwards'
129.	nsiwa 'nine'	tuwa- 'nine'
130.	nsoka 'stab'	tok 'stab'
131.	solo 'mountain'	tool 'mountain'
132.	sulu 'torch'	tiil 'torch'
133.	sili 'penetrate'	til 'penetrate'
134.	suli 'shoot, sucker'	iil 'shoot, sucker'
135.	susu 'breast'	tiiti 'breast'
136.	-nta 'our (inclusive)	-ta- '1st person pl. possessive'
137.	tali 'cord, rope'	sáal 'cord, rope'
138.	talinga 'ear'	salɛng 'ear'
139.	tama 'father'	saam 'father'
140.	tanum 'bury'	sowsow 'grave'
141.	tangi(s) 'weep'	sɛng 'weep'
142.	tapu- 'conch'	sɛwi or sowi 'conch shell trumpet'
143.	tapu(n)i 'afterbirth'	sow 'afterbirth'
144.	tansi(k) 'sea, salt water'	seet 'sea'
145.	tau 'man, person'	sow- 'practitioner of'
146.	taqu 'year, season'	sow(npar) 'year'
147.	tina 'mother'	iin 'mother'
148.	toko(n) 'staff, pole'	sokon 'cane'
149.	tolu 'three'	sili. 'three
150.	topu 'sugar cane'	seew 'sugar cane'
151.	tuki 'hammer, pound'	suk 'hammer, pound'
152.	tupa 'fish poison'	uup 'fish poison'
153.	tumpu(q) 'grow'	ipw- 'parentage'
154.	tusu(k) 'to point'	it 'to point'
155.	tuqu(d) 'stand up'	uu(ta) 'stand up'
156.	quda(ng) 'lobster'	urɛ(nna) or wirɛ(nna)
157.	qulung 'pillow'	ulung or uluul 'pillow'
158.	qumu 'earth oven'	uumw 'earth oven'
159.	quna(p) 'fish scale'	winɛ 'fish scale (its)'
160.	uto 'float of fishing net'	uus 'float of fishing net'
161.	walu 'eight'	wɛli- 'eight'
162.	wawa 'mother's brother'	waawa 'nephew relationship'

PACIFIC AREA LANGUAGES MATERIALS
(PALM) Development Center
2424 Maile Way, Porteus 713
Honolulu, Hawaii 96822